Increasing Intention to Adopt Green IS with Persuasive Systems Design: Case JouleBug Mobile Application

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Abstract

Growing importance of sustainability resulted in increasing interest in ecologically related issues in Information Systems (IS) research. Ubiquitous technology unavoidably influences people's lives. Among other tools, persuasive systems have been used to evoke behavioral change to reach desired outcomes, e.g. increased consumer loyalty, higher health awareness, or sustainable behaviors. This paper examines how perceived persuasiveness and attitude towards IS encourage intention to adopt Green IS. To test these influences, we construct a research model and conduct a survey, based on a mobile application JouleBug, a social digital platform for engaging in sustainable behavior. Overall, the results of the PLS-SEM analysis support that both perceived persuasiveness and attitude statistically significantly impact intention to adopt Green IS, whereas perceived persuasiveness is influenced by primary task support, and attitude is influenced by social affirmation and perceived effectiveness, meanwhile, dialogue support influences both primary task support and social support.

Keywords: Persuasive technology, behavior change, Green IS, sustainability, structural equation modeling.

1. Introduction

Omnipresent social web, extensive use of the Internet, mobile, and other ambient systems create opportunities for influencing users with persuasive communication. Interactive information systems (IS) designed for changing users' actual attitudes or behaviors emerged from persuasive technologies [1], and Persuasive Systems Design (PSD) [2] is one of the prominent frameworks for their development. Up-to-date, fostering improved health and healthier lifestyles has been a dominant area of persuasive systems application. Nonetheless, PSD can be handy in evaluating and creating Green IS to support sustainable behavior change [3, 4, 5]. Benefits of using Green IS for encouraging pro-environmental behavior are manifold, ranging from increasing energy consumption control to larger indirect benefits for society, such as lowering greenhouse gas emissions [6]. Nevertheless, Green IS cannot achieve the positive impact without the individuals' motivation to acquire sustainable behavior, i.e. behavior that harms the environment as little as possible, or even benefits the environment [7]. Oftentimes, such behavior is seen as not enjoyable because it is linked to personal disadvantages like behavioral constraints or loss of comfort [8]. Although new eco-friendly technologies are widely available nowadays, they alone cannot guarantee a successful implementation of sustainable practices. Most of the time, the intensity of negative environmental impacts can be reduced, or even eliminated, by changing a root of environmental problems – human behavior [7], which remains the most important factor for achieving environmental sustainability. Because behavior change is typically not fun and sometimes not voluntary [9], resistance to Green IS adoption increases since changes in existing routines are required [10]. Green IS adoption calls for behavior changes because individuals need to accept, understand, buy, and use these

innovative systems and technologies properly. The increasing availability and ease of use of mobile applications make Green IS easily accessible for the wide audience. Hence, we study a mobile app that encourages sustainable behavior. We examine factors that affect perceived persuasiveness and attitude to research the extent to which they impact Green IS adoption:

RQ: How do perceived persuasiveness and attitude influence intention to adopt a Green IS?

To answer the research question, we use frameworks and theories related to attitude and behavior change to hypothesize connections and relationships among PSD constructs (this paper focuses on primary task support, dialogue support, and social support), perceived persuasiveness, perceived effort, perceived effectiveness, social affirmation, attitude, and intention to adopt Green IS. We analyze the data collected with the survey with the structural equation modeling. Finally, we discuss the findings, draw implications and conclusions based on the obtained results.

2. Theoretical Background

2.1. Green IS as an Application Domain

Green IS describes the utilization of technologies and systems that serve as "a potential enabler of green, sustainable solutions" [11, p. 1] and as a potential enabler of behavioral change by individuals, organizations, and society [12]. Green IS applications assist users with acquiring sustainable behaviors; thus, intention to use a Green IS app is a step towards this ultimate goal. Initially, Green IS focused on business and industries attempting to emphasize how Green IS can become an integral part of business processes, how Green IS can develop capabilities of firms to adopt and practice sustainability, and how firms can design new techniques. However, actions of individuals are crucial for macro-level initiatives: the beliefs-actions-outcomes (BAO) framework suggests that beliefs of individuals contribute to shaping organizational and societal sustainable actions [13]. Thus, Green IS research initiated consideration of user-centric solutions for sustainable improvements that encourage individuals to choose more sustainable behaviors in their day-to-day routines [14]. Currently, only a few studies investigate how environmental behavior and decisions of individual system users can be improved with Green IS [15]. Pitt et al. [16] noted that the research of smartphone applications related to the pursuit of green and sustainable agendas is needed to provide implications for academics in social sciences in general, and for IS strategy scholars in particular.

2.2. Persuasive Systems Design (PSD) Model

PSD model [2] is a method for designing and evaluating persuasive systems. Behavior Change Support Systems (BCSSs) are a type of persuasive systems defined as "sociotechnical information system(s) with psychological and behavioral outcomes designed to form, alter or reinforce attitudes, behaviors or an act of complying without using coercion or deception" [17, p. 1225]. The PSD development process starts with recognizing fundamental issues behind persuasive systems, and continues with analyzing persuasion context. Next, the persuader and the persuasion type, i.e. attitude and/or behavior change, are identified (persuasion intent, event, and strategy). After that, persuasive design principles are implemented. Design principles of the primary task support, i.e. such as reduction, tunneling, tailoring, personalization, self-monitoring, rehearsal, and simulation, directly assist with the goals of the user. Computer-human dialog support features, i.e. rewards, praise, suggestions, reminders, similarity, liking, and social role, facilitate accomplishing goal(s) through communication between the system and the user. Credibility support principles, i.e. trustworthiness, expertise, surface credibility, real-world feel, third-party endorsements, verifiability, and authority, increase persuasiveness of the system by making it more credible. Social support design principles, i.e. recognition, competition, cooperation, normative influence, social learning, social comparison, and social facilitation motivate users by leveraging social behaviors. Persuasive system

features enhance user participation and engagement with the interventions. Because additional persuasive features may lead to decreased overall persuasiveness, not all possible software features have to be present in a BCSS [17].

2.3. Perceived Persuasiveness

Attempts to convince the user to change the behavior define intended persuasiveness, i.e. an extent to which the design of the system allows for persuasive potential. Subsequently, perceived persuasiveness is the extent to which this potential is realized, i.e. how much the user (the recipient of the persuasive message) perceives the message as being convincing. In existing models of attitude change, messages are presented, received, processed, and if successful, recipients shift their actual attitudes towards the advocated position [18]. The altered attitude may lead to subsequent behavior change. Thus, effective persuasion happens when the target of change (e.g. attitudes, beliefs) is modified in the intended manner [19]. It is believed that "an attitude represents an evaluative integration of cognitions and affects experienced in relation to an object" [18, p. 347]. Perceived persuasiveness is defined as an individual's favorable impression of the system [20, 21].

2.4. Social Affirmation

Social affirmation is a construct based on social influence and subjective norms. It differs from the social support category in the PSD model. According to the theory of reasoned action (TRA), behavior is determined by normative beliefs and motivations, such as social norms [22]. Social influence or social norm is a construct that captures an individual's perceived expectations of specific referent individuals or groups, and an individual's motivation to comply with these expectations [22, 23]. In other words, social influence describes how people other than the user evaluate the utilized system. It also captures how the user perceives the fact that others evaluate the system. Social influence considerably impacts both attitude towards the use of gamification and attitude towards the perceived amount of social recognition received as feedback [24]. The user's perception that significant individuals and other people value the system has a positive impact on the user's own perceptions and attitudes. Several models of technology acceptance, such as TAM2 [25], UTAUT [26], and UTAUT2 [27], incorporate social influence as a direct antecedent of the behavioral intention to use technology. In these models, social influence refers to the individual's perception that important social actors expect the individual to use a technology. In this paper, to emphasize our focus on the confirmatory impact that the other people have on the user's disposition towards using the system, a term "social affirmation" is used instead of "social influence".

2.5. IS Adoption

In IS research, a topic of acceptance/adoption constitutes a comprehensive area dedicated to analyzing the cause, influence, and identification of factors to draw and improve the acceptance of information technologies in various application areas [26]. Terms "adoption" and "acceptance" describe the willingness of a person to use a certain technology [3]. Technology acceptance theories explain the individual behavior of technology use. The most prominent model is the technology acceptance model (TAM) [28], based on TRA. TAM conceptualizes the acceptance of technology as behavioral intention to use a technology, while adoption is seen as the actual use of technology. In the model, behavioral intention leads to actual use (i.e. acceptance leads to adoption). Behavioral intentions are viewed as an immediate predictor of behavior, and thus, behavioral intentions are often used as a proxy for a system usage. TAM explains acceptance of technology by perceived ease of use, perceived usefulness, and attitude towards technology [28]. In terms of TRA, these constructs reflect the individuals' beliefs in the consequences of adopting a certain behavior and the subjective evaluation of these consequences [29]. The extended model, TAM2 [25], elaborated on the reasons why the users found a system useful at pre-implementation, one month post-implementation, and three month post-implementation.

TAM2 and the model of the determinants of perceived ease of use [30] were later combined into an integrated model of technology acceptance – TAM3 [31]. The Unified Theory of Acceptance and Use of Technology (UTAUT) [26] combined previous technology acceptance models and theories to increase the explanation of technology acceptance behavior. The UTAUT's predictors of users' behavioral intention are performance expectancy, effort expectancy, social influence, and facilitating conditions. The five similar constructs (perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectations) form performance expectancy while effort expectancy captures the notions of perceived ease of use and complexity. Social influence denotes the effect of peers on the decision to use a system, while facilitating conditions define the perceived availability of the required infrastructure to use the system. UTAUT2, created to improve the fit of the model for the consumer use context [27], has three additional constructs: hedonic motivation, price value, and habit.

3. Research Model and Hypotheses

Based on the theoretical background, the following research model and hypotheses are proposed (Figure 1). This model is not specifically tailored to Green IS, and thus can be tested in various contexts with different BCSSs. Nevertheless, the model is the first one to our knowledge to capture influence of both perceived persuasiveness and attitude (while being affected by social affirmation, perceived effort and perceived effectiveness) on intention to adopt an IS.

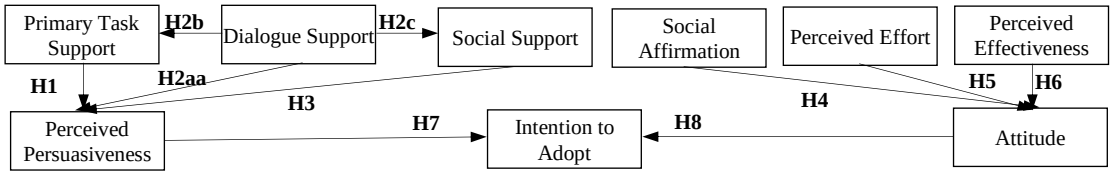

Fig. 1. Research model

Primary task support influences perceived persuasiveness (H1). Primary task support provides the means to assist the user in carrying out the behavior. By enhancing self-efficacy of the user with the primary support features, cognitive burden and disorientation involved in using the system can be reduced [32]. Primary task support is related to cognitive fit [33], task-technology fit [34] and person–artefact–task fit [35]. It enables reflection on the individual's behavior, personal goal-setting and tracking progress towards the goals [36]. As a result, if a system supports fulfillment of the primary task, it is likely to be perceived as more convincing. Hence, primary task support features help overcome psychological barriers and reduce perceived complexity of engaging in sustainable behavior viewed by some people as a burden [37].

Dialogue support influences perceived persuasiveness (H2a), primary task support (H2b), and social support (H2c). Dialogue support keeps the users active and motivated to use the system, helping to perform target behavior. Ideally, dialogue support promotes users' positive affect, which will likely influence confidence in the source (credibility) [20, 21]. Moreover, people's reaction to IT artefacts is similar to interaction in social situations [38, 39]. Additionally, people's social relationships are increasingly maintained through technology-mediated communications, hence, dialogue support is likely to influence social support, i.e. interaction with the other users of the system.

Social support influences perceived persuasiveness (H3). Social support design principles motivate users by leveraging social influence that is fundamental for pro-environmental mindset and behavior [40]. When feeling a necessity to join a community, some people will be open to adjust own behavior to match the behavior established by the current members of that community [41]. Opinions of friends, family and peer are highly likely to change one's view on adoption of sustainable behavior [40]. Social activities and interaction with like-minded people with similar interests or personal goals can promote

the users' favorable perception of the Green IS and increase willingness to engage in sustainable behavior [37]. Therefore, whenever an IS platform enables such interaction, chances are higher that the user will perceive the system as more persuasive.

Social affirmation influences attitude (H4). Performing eco-friendly behaviors often means conforming to social norms [42]. Subjective norms are important because human behaviors are embedded in a social context. The extent to which fulfilling expectations of the others together with peer pressure affect an individual's behavior depends on the individual's inclination to conformity. A subjective norm is defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question" [22, p. 302]. Similarly, social influence refers to the individual's perception of how important others regard the target behavior and whether they expect the individual to perform that behavior [22]. Additionally, the subjective norm implies that its users get approval from friends, neighbors, or family members, and thus, social influence is likely to effect the user's own perceptions and acceptance of a Green IS. Based on the previous findings [25, 43], we assume that social affirmation affects the attitude towards Green IS. Moreover, existing research [44, 45, 46] suggests that the social influence affects users' actual attitude towards using IS.

Perceived effort influences attitude (H5). In theoretical models of technology adoption, perceived ease of use (TAM) and effort expectancy (UTAUT) have been central constructs in explaining intention to use. Effort expectancy is defined as the degree of ease associated with the use of the system. Effort-oriented constructs are expected to be more significant in the early stages of a new behavior, when process issues appear to be more burdensome, while later they become overshadowed by instrumentality concerns [26]. According to one of the propositions of the expectancy theory of motivation [47], one's effort will result in the attainment of desired performance goals. Therefore, we hypothesize that at least in the initial stage of forming sustainably oriented thinking perceived effort is likely to influence shaping a positive attitude towards a Green IS.

Perceived effectiveness influences attitude (H6). In the UTAUT model, performance expectancy predicts attitude. In this study, a similar construct, perceived effectiveness [48], is used to capture the success of the mobile application. Unlike primary support, which describes features that support the desired behavior, perceived effectiveness measures users' perceptions regarding whether the system is successful in helping the users to acquire sustainable behavior. It is deemed logical that, if the users do not perceive the app to be effective, they are more likely to have an unfavorable attitude towards using it.

Perceived persuasiveness influences intention to adopt (H7). Perceived persuasiveness has a moderate but significant impact on intention to adopt the system [20, 21]. However, the success or failure of an IS artefact depends on whether consumers resist using it or are willing to adopt, and to engage with it [49]. IS research has developed various models to understand the factors that drive consumers either to resist a technology [50] or to adopt [26] and continuously use it [51]. Among other antecedents of behavior, behavioral intention is seen an immediate determinant and predictor of behavior and, consequentially, behavior change. Although perceived persuasiveness and attitude are related concepts, this study does not focus on investigating their relationship.

Attitude influences intention to adopt (H8). Attitude is people's actual positive or negative feelings about performing the target behavior [23]. Effective persuasion happens when the target of change (e.g. attitudes, beliefs) is altered in the desired direction [19]. The modified attitude may have an impact on subsequent behavior under appropriate conditions [18]. Prior research found significant support for the impact of attitudes on the intention to adopt information technologies [52] self-service technologies [53], and Green IS [54]. According to TRA, TPB [23], and TAM, attitude of an individual influences intention, an essential component of performing a behavior.

4. Research Method

JouleBug, a mobile application for iOS and Android, was used as an example of Green IS. It was created to assist the users with making their everyday habits more sustainable at

home, work, and play (https://joulebug.com/). The app encourages using resources in an environmentally friendly manner. The app organizes sustainability tips into "Actions" for the users to explore, complete, and "go green". When the users finish an action in real-time, they "buzz" (i.e. post a text message with or without an image) within the app to notify the other users of the achievement. For each "buzz" the users receive points. The users can also get "Badges" for becoming experts in a certain field of sustainability. The app contains stats and the "Trophy Case" to track the user's impact on environment. The users are encouraged to follow friends and neighbors, to browse the community feed and extend the network in which sustainable achievements are shared. Occasionally, the app offers local and national challenges that last for a certain period and prompt competitions at being "the greenest" either individually or in teams (depending on a type of a challenge).

4.1. Instrument Development

First, we analyzed the app using the PSD model. The following categories and features were found: (a) primary task support: self-monitoring, reduction, simulation; (b) dialogue support: praise, rewards, suggestions, reminders, liking; (c) credibility support: surface credibility; (d) social support: social learning, social facilitation, recognition, competition, social comparison. We focused on categories represented by more than one persuasive feature (thus, omitting credibility support) and proceeded with studying the following items: (1) primary task support: reduction, self-monitoring, and simulation, (2) dialogue support: praise, reward, and liking, (3) social support: social learning, social facilitation, and social comparison. To assess the respondents' comprehension of functionality of the app, we reversed one item in each PSD construct, and we added an item representing a persuasive feature absent in the app, e.g. tunneling in primary task support, social role in dialogue support, and normative influence in social support. The latent variables were measured using reflective multiple-item scales adopted with or without modifications for the context of the study from the pre-validated measures (see sources of the constructs in Appendix, Table 1). The items were measured with a 7-point Likert scale (from 'Strongly disagree' to 'Strongly agree') to determine the extent to which participants agree with the statements. A pilot survey was conducted among the PSD experts who provided feedback to refine the PSD-related items created for this study.

4.2. Data Collection

An online software tool Webropol 2.0 was used to implement and distribute the survey on multiple social media platforms in May 2018. Participants (residents of the European Union) were asked to watch a video (https://youtu.be/sYfFkMUaUJo) showing functionality of the JouleBug mobile app. Questions related to the PSD, perceived persuasiveness, perceived effort, perceived effectiveness, social affirmation, attitude, intent to adopt, as well as demographic related questions about age, gender, education, and employment were asked. In total, 81 complete answers with no missing responses were obtained (all survey questions were set as mandatory and were displayed in the same order to all respondents). Despite that, 20 responses were eliminated due to uniform responses to all questions or due to inadequately short time taken to complete the survey, leaving 61 responses for the further analysis (Table 1).

Table 1. Descriptive Statistics of the Sample.

Demographics	Value	#	%	Demographics	Value	#	%
Age	18 - 24	26	43%	**Employment**	Employed full-time	17	28%
	25 - 34	25	41%		Employed part-time	3	5%
	35 - 44	3	5%		Self-employed	3	5%
	45 – 54	4	7%		Student	36	59%
	55 – 64	3	5%		Unemployed	2	3%
Gender	Female	50	82%	**Education**	High school	9	15%
	Male	11	18%		Bachelor's Degree	27	44%
					Master's Degree	19	31%
					Doctorate Degree	6	10%

5. Data Analysis and Results

SmartPLS 3 with graphical user interface for variance-based structural equation modeling (SEM) with the partial least squares (PLS) path modeling method was used. PLS-SEM predicts rather than tests established theory, so it suits well for exploratory research [55]. The minimum sample size should be equal to the larger of either (1) ten times the largest number of formative indicators used to measure one construct or (2) ten times the largest number of structural paths directed at a particular latent construct in the structural model [55]. In this study, two dependent latent variable with the largest number of independent latent variables are attitude (impacted by social affirmation, perceived effort, and perceived effectiveness) and perceived persuasiveness (impacted by primary task support, dialogue support, and social support). Thus, the smallest sample size is 30 (i.e. 10 times 3); however, a larger sample size can increase the stability of the estimates. The sample size of this study meets and exceeds the requirement. PLS-SEM model testing involves (1) assessing reliability and validity of the measurement model and (2) assessing the structural model [55]. The measurement model includes the relationships between the constructs. The convergent and discriminant validity of the measurement instrument is examined to verify that the constructs' measures are valid and reliable before drawing conclusions regarding relationships among constructs. As all variables were measured using the same instrument, common method bias (CMB) is a potential threat to the validity of the results. To minimize CMB ex ante, respondents were guaranteed anonymity and confidentiality, and were encouraged to answer as honestly as possible. For the ex post test and for a possible control of CMB, a correlation matrix of the constructs was inspected for correlations above .9 (a sign of CMB) [56]. None of the constructs correlated so highly.

5.1. Assessment of Measurement Model

The properties of the scales are assessed in terms of item loadings, discriminant validity, and internal consistency using the PLS procedure. Item loadings and internal consistencies greater than .7 are considered acceptable [57] (Appendix, Table 1). The constructs display good internal consistency, as evidenced by their composite reliability scores, with the lowest of .855 and the highest of 1 (DIAL, a single item construct). AVE values of all constructs were above the suggested minimum of .5 [57] demonstrating adequate internal consistency (Appendix, Table 2).

5.2. Structural Model and Hypotheses Testing

To evaluate the structural model, parametric bootstrapping with 5000 subsamples (parallel processing, no sign changes) was applied. The confidence interval method was the two-tailed bias-corrected and accelerated bootstrap (a default software setting). Obtained path coefficients indicate the strength of the relationship of independent and dependent variables, while R^2 measures the predictive power of the model for the dependent variables [55]. The results of the PLS analysis provide substantial support for the proposed research model since hypotheses H1, H2b, H2c, H4, H6, H7, and H8 were supported (see Figure 2). In the structural model, primary task support, dialogue support, and social support explain 52% of the variance in perceived persuasiveness. Dialogue support alone explains almost 41% of the variance in primary task support and 20% of the variance in social support. Social affirmation, perceived effort, and perceived effectiveness explain 67% of the variance in attitude. Together attitude and perceived persuasiveness explain 76% of the variance in intention to adopt. When controlling for the effect of gender on intention to adopt, a statistically significant negative impact was observed (β = -.181, p = .005) increasing the percentage of the overall variance explained to 79%. The other sample-related variables, such as age, education, and employment had no statistically significant influence on intention to adopt. Total effects and their sizes were also examined (Appendix, Table 3). Effect sizes (f^2) determine whether the effects indicated by path coefficients are small (.02), medium (.15), or large (.35) [58]. Effect sizes below .02 are considered to be too weak to be relevant. The obtained results suggest that most effect sizes are above the

.02 level, thus indicating their practical relevance. Additionally, a blindfolding procedure was used to observe the predictive validity of the model. All endogenous constructs demonstrate Stone-Geisser cross-validated redundancy value Q2>0, and thus indicate adequate predictive validity of the path model in connection with an endogenous latent variable.

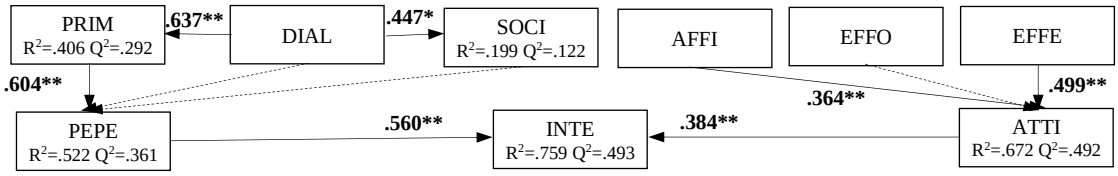

Fig. 2. Results of the PLS-SEM analysis (**p≤.001, *p≤.005).
Note: Solid arrows indicate supported hypotheses

6. Discussion

Results of the PLS-SEM analysis support interaction of the persuasive system categories from the PSD model suggested by findings of the previous studies [20, 22, 24, 48, 59]. An impact of dialogue support on primary task suggests that interaction of the system with the user is important for accomplishing the primary task, i.e. sustainable behavior. A significant impact of dialogue support on social support suggests that the user's interaction with the system influence the user's interaction with the other users of the system. Contrary to what was anticipated, among the three PSD categories, only primary task support showed a significant impact on perceived persuasiveness. The experimental nature of the study and the context of the app could be the reason for this outcome. Perhaps, to perceive the app as persuasive and to have favorable impression of it, primary task support was sufficient for the participants. Moreover, the overwhelming presence of technologies and social media could have impacted the respondents so that they do not associate communication with the app (dialogue support) and with the other users of the app (social support features) with the overall favorable perception of the system (perceived persuasiveness). This finding confirms the premise that not all possible persuasive features have to be present in a system, since implementation of additional persuasive features does not guarantee increase of the overall persuasiveness, and can contribute to the decrease in the overall persuasiveness [17]. Analyzing influences on attitude towards the Green IS, social affirmation and perceived effectiveness have a statistically significant impact while perceived effort does not. This finding suggests that the respondents' attitude towards the app is independent of how difficult or easy it is to use (i.e. how much effort they would have to put in in order to use the app). Conversely, perceived effectiveness (i.e. extent to which the users find the app to be useful) as well as social affirmation (i.e. approval/disapproval of the app expressed by the other people important for the respondents) did show an impact on attitude towards the app. This outcome may again be due to the experimental nature of the study. Furthermore, the relationship between attitude and intention to adopt suggested by the TRA and the TPB and supported by previous research was also significant in this study. Additionally, other hypothesized relationships implied by the preceding studies (social affirmation and perceived effectiveness, social affirmation and attitude) proved to be significant in this study too. Overall, comparing influence of perceived persuasiveness and attitude on intention to adopt the app, both were found to be statistically significant with perceived persuasiveness having a stronger impact. Finally, gender showed a significant impact on intention to adopt the app, specifically that women express a stronger intention to adopt the app compared to men. Despite unequal number of female and male respondents, a different response to the control variable calls for further investigation of the gender-related dissimilarities in intention to adopt the app. No other sample-related variables (age, education, and employment) showed a statistically significant impact on intention to adopt Green IS.

7. Conclusions

The study explored perceived persuasiveness and attitude as factors that directly impact intention to adopt Green IS as well as the underlying constructs, i.e. persuasive categories, social affirmation, perceived effectiveness, and perceived effort. Although the study is limited by the size and uniformity of the sample as well as the setup (i.e. showing video and assessing respondents' initial impression), the framework and the concepts can be applied to other settings and contexts. The study informs practitioners about benefits of the PSD model for enhancing systems and applications that encourage sustainable behavior. Systems designers need to recognize factors that influence users' decision-making and choose suitable persuasive techniques. Main contributions include the PSD analysis of the JouleBug app, the constructed research model, development of the measurement instrument, extending academic knowledge on adoption of Green IS, and providing ideas about designing more persuasive and motivating Green IS. Findings suggest that perceived persuasiveness, concepts that contribute to it, and possibly the user's gender influence intention to adopt Green IS. In further research, the setting of the study can be modified to survey respondents after they use the app themselves. When using the app individually, the users might be influenced by the app in a different manner compared to watching the video due to a different comprehension of the features of the app. The distinctions of various study set-ups can also be investigated. The respondents' environmental disposition and previous exposure to Green IS can be assessed prior to using the app. A larger, more diversified sample with a more balanced ration of female and male participants can increase generalizability and provide new insights. Changes to the research model can be implemented, e.g. including credibility support from the PSD model as a predictor of perceived persuasiveness, considering persuasive postulates not explored in this study, and engaging other factors that are likely to shape attitude towards Green IS.

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Appendix

Table 1. Survey Instrument.

Construct	Items	Load
Primary Task Support (PRIM) [2]	Self-monitoring: The app helps me track and monitor my behavior.	.904
	Tunneling: The app guides me through the process which helps perform the target behavior	-
	Simulation: The app allows me to simulate the cause and effect of my behavior on the environment.	.890
	Reduction: The app increases complexity of sustainable behavior by breaking it unnecessarily into separate tasks. (reverse scaled)	-
Dialogue Support (DIAL) [2]	Praise: The app encourages me based on my behavior.	1.00
	Rewards: The app reveals my failure in performing my target behavior. (reverse scaled)	-
	Social role: The app offers a virtual specialist to establish a personal relationship with me.	-
	Liking: The app is visually appealing in terms of look and feel.	-
Social Support (SOCI) [2]	Social learning: The app allows me to observe actions and outcomes of other people.	.952
	Social comparison: The app prevents me from comparing myself with others. (reverse scaled)	-
	Social facilitation: The app shows me the other people's level of engagement in sustainable behavior.	.852
	Normative Influence: The app shows me what sustainable behavior norms are.	-
Perceived Persuasiveness (PEPE) [17, 20, 21]	The app has an influence on me.	.885
	The app is personally relevant for me.	.880
	The app makes me reconsider my habits.	.936
	The app persuades me to adopt desirable sustainable behavior.	.839
Perceived Effectiveness (EFFE) [26, 27]	My chances of becoming more sustainable would improve by using the app.	.920
	In my opinion, using the app would have an effect on my sustainable behavior.	.954
	My chances of becoming more sustainable would decrease by using the app.	-
	In my opinion, the app would have no effect on my sustainable behavior. (reverse scaled)	.730
Perceived Effort (EFFO) [26, 48]	Using the app does not require a lot of effort.	.786
	Using the app is straightforward.	-
	Using the app requires considerable time and effort. (reverse scaled)	.762
	Using the app is burdensome. (reverse scaled)	.892
Social Affirmation (AFFI) [6, 27, 23]	People who influence my attitudes would recommend the app.	.812
	People who are important to me would think positively of me using the app.	.901
	People whom I appreciate would encourage me to use the app.	.942
	My friends would think using the app is a good idea.	.912
Attitude (ATTI) [6, 28]	All things considered, I find using the app to be a wise thing to do.	.899
	All things considered, I find using the app to be a bad idea. (reverse scaled)	.874
	All things considered, I find using the app to be a positive thing.	.884
	All things considered, I find the app to be favorable to use.	.936
Intention to Adopt (ADOP) [28, 48]	I would use the app in the future.	.946
	I would be willing to try the app in the future.	.904
	I would consider using the app in the future.	.963
	I would not use the app in the future. (reverse scaled)	.950
Note. Items in italics were deleted due to values of the outer loadings significantly below the critical value (.7)		

Table 2. Latent Variable Correlations.

	CA	CR	AVE	ATTI	DIAL	EFFE	EFFO	INTE	PEPE	PRIM	AFFI	SOCI
ATTI	.920	.944	.807	.899								
DIAL	1.000	1.000	1.000	.561	1.000							
EFFE	.842	.905	.763	.739	.449	.873						
EFFO	.766	.855	.665	.366	.195	.198	.815					
INTE	.957	.969	.885	.772	.461	.686	.359	.941				
PEPE	.908	.935	.784	.692	.567	.647	.320	.826	.885			
PRIM	.758	.892	.805	.573	.637	.501	.206	.567	.706	.897		
AFFI	.915	.940	.798	.709	.579	.594	.394	.697	.769	.620	.893	
SOCI	.789	.899	.816	.414	.447	.310	.145	.374	.482	.707	.411	.904
CA = Cronbach's Alpha; CR = Composite reliability; AVE = Average Variance Extracted; Bolded cells = Sq. root of AVE												

Table 3. Total Effects and Effect Sizes (Cohen's f^2).

	ATTI	INTE	PEPE	PRIM	SOCI
ATTI		.387(.323)**			
DIAL		.316	.568 (.049)$^{n.s.}$	.637 (.684)**	.447 (.249)*
EFFE	.498 (.498)**	.193			
EFFO	.124 (.040)$^{n.s.}$	.048			
PEPE		.557 (.670)**			
PRIM		.336	.603 (.282)**		
AFFI	.365 (.231)**	.141			
SOCI		-.018	-.033 (.001)$^{n.s.}$		
** $p \leq .001$; * $p \leq .005$; n.s. = non-significant; (f^2) = Cohen's f^2 (for direct effects only)					